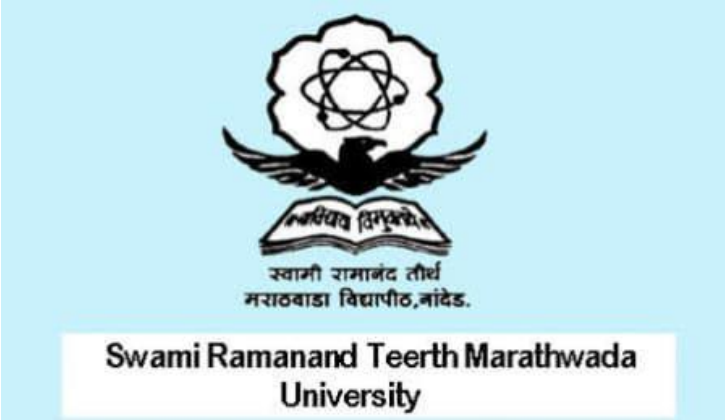

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED

A STUDY OF INVENTORY CONTROL TECHNIQUES IN HEALTH MANAGEMENT OF LIFE CARE COMMODITIES

In

Statistics

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1. Introduction

In general, inventory control refers to idle goods or materials detained by an organization for use sometime in the future. Items carried inventory include raw materials, purchased parts, components, sub-assemblies, work in process, finished goods, supplies. Some reasons organizations maintain inventory include the difficulties in precisely preceding sales level production times, demand rate, usage needs, replenishment cycle. Thus, an inventory serves as a buffer against uncertain and fluctuation usage and keeps a supply of items available in case the items are needed by the companies and organizations or its customers.

Due to the rapid growth in healthcare expenditure worldwide and simultaneous growth of demand for healthcare services, developing efficient and effective healthcare systems has become an essential area of concern for governments and healthcare decision-makers (Ahmadi-Javid, Jalali, & Klassen, 2017).

The core competency of a healthcare system reflects its ability to provide treatment and care to the patients. The prime focus has always been towards providing highly knowledgeable and experienced physicians, surgeons, well-trained nurses, and medical staffs with well-established infrastructure, advanced medical equipment, the right quality medicines, and medical and surgical supplies (De Vries, 2011). However, of late, the focus has driven towards the management side of the healthcare systems. Healthcare management systems include capacity planning, resource allocation, inventory management systems, demand forecasting, scheduling, and other operational activities (Brailsford & Vissers, 2011).

An important factor that affects the managerial and operational performance of healthcare systems, in general, and hospital systems, in particular, is the inventory management system. Inventory management refers to managing and controlling a large number and great variety of items stocked in a healthcare system (Gebicki et al., 2014, Nicholson et al.)

The ultimate objective of healthcare systems is to provide proper treatment and care to patients. However, an appropriate procedure of treatment requires preparation of specific steps of processes before the arrival of the patient, such as maintaining a stock of medicines and medical and surgical items in the hospital (Fitzsimmons & Fitzsimmons, 2006). A well-maintained

inventory control system helps the patient to receive medication without any delay and prevent out-of-stock situations in hospitals. On the other hand, an inadequate inventory control system results in several critical issues, such as the worsening of the patient's condition or development of antimicrobial resistance due to delay in treatment procedures (Management Sciences for Health, 2012).[15]

2. Literature review

Time-varying demands were first considered by Silver and Meal [1]. In this model, they established the Heuristic solution procedure. Also Silver and Meal [1] developed a model for deterministic time-varying demand, which also gives an approximate solution procedure termed as Silver – Meal Heuristic. Many research articles by Donaldson [2], Silver [3], Dave and Patel [4], Dave [5], Bahari-Kashani [6], Chung and Ting [7], Giri, Goswami and Choudhuri [8], Lin, Tan and Lee [9] and many more have analyzed liner time-varying demand. Roy and Choudhuri [10] established a non-static single-choice acquisition model for weakening things in which time-changing ramp-type demand, consistent deterioration and deficiency were considered.

An Pan1 and Chi-Leung Hui2 [11]studies a partial backordered continuous review inventory control problem in which the product demand follows a Poisson process with a constant lead time.The healthcare apparel service centre, under the capacity constraint, aims to minimize the inventory cost and achieving a low stockout risk. To address this challenge, an optimization problem is constructed. the result shows that the expected total cost on an order cycle is reduced substantially at around 20% with our proposed optimal inventory control policy. An extensive sensitivity analysis is conducted to generate additional insights.

Dr. S. K. Sinha Dr. Ruchi Goyal Sunil Kumar[12] examine the trends in inventory management and its impact on firms‟ performance and to examine significant difference between the profitability of firms and industries.In this study, used panel data regression for the investigation of the results.the final analysis of the operational efficiency, liquidity and profitability of the Indian Pharmaceuticals firms have shown a significant changes and it also shows how best practices are prevailing in the Cipla Ltd. and others, which are contributing to performance.

Hacer GünerGören1, Özge Dağdeviren1 [13] study the inventory management in health The aim of this study was to determine the importance of drugs in a hospital's pharmacy via ABC, VED and ABC-VED Matrix Analyses. Based on the results, order quantities were determined using Economic Order Quantity model. In order to cope with numerous drugs, an Excel-based inventory system was built to do the analyses quickly and efficiently.

Mir Mohammed Junaid Basha,Navya V.S,Sonali Tukaram Wani and Prof. Vivekanand S Gogi [14] The study uses the inventory audit procedure to improve the inventory status of pharmaceuticals by selective inventory control techniques.because of the current situation, of COVID-19 Pandemic, there is a lot of reduction in capsule production, many of the pharmaceutical industries have rejected orders due to shortage of medicinal products during lockdown. This study uses systematic evaluation, statistical methods, Fuzzy logic, ABC-VED, EOQ, JIT etc. based on these methods the classification of various models for pharmaceutical inventory are incorporated.if the above-mentioned methodological principles are implemented together in an automated environment such as VHP, which can help to keep stocks at an optimum level. While minimizing losses due to expired drugs and delays in ordering new stocks, we can minimize costs due to the low inventories (JIT) concept and the high availability of drugs based on their critical factor.

3. Gaps in the existing research

The formulating the real data for Health care system and represents the parameters in inventory model to optimizing the essential parameters as time run, order quantity, shortage quantity if shortage cost is allowed. That leads to reduce the losing quantity because the deterioration in pharmaceuticals.

4. Statement of proposed problem

A healthcare system may face several inventory control-related problems.

The main problems of inventory management in the health care system requires the :

- an appropriate procedure of treatment requires preparation of specific steps of processes before the arrival of the patient, such as maintaining a stock of medicines and medical and surgical items in the hospital.
- The optimal time for replenishment.
- accurately predict the demand in a healthcare system due to uncertainties and randomness, such as changing patient conditions, dynamics in physicians' prescriptions, and variation in responses of the individual patient to treatment procedures.
- The inventory level to satisfy the demand rate.
- The optimal total cost.
- The optimal shortage quantity in stock if shortage cost is allowed.

5. Relevance of the research work

Analysis on the Inventory Management for health care system in 2019 is conducted [], in this study the Inventory Management is needs to be compatible with its operations and critical characteristics ensuring minimization of inventory-related cost as well as maximization of service level with a significant reduction in the price of treatment and wastage of resources. The health care system inventory management techniques has been incorporated with different models which are the (Q,r)-based optimal inventory control policy, FIFO , Economic Ordering Quantity, ABC analysis,VED Matrix and Use periodic review model are used to understand the Inventory management.

6. Significance of Study

The inventory models can be used:

- To find minimum deterioration for pharmaceuticals (permissible quality) and optimal quantity to satisfy the patient based on the data collected from health care system.
- To manage all types of drugs that have deterioration and through optimal quantity and optimal inventory cost in health care system by representing the best model for the demand rate, deterioration rate.

- To manage all types of medical equipments, infrastructures through optimal quantity and optimal inventory cost in health care system by representing the best model for the demand rate.

7. Objectives of the proposed research

- To Study of different Units, commodities in health care with inventory control techniques.
- To obtain the optimal order quantities regarding the demand rate and deterioration rate of commodities.
- To management order economic quantity in case of deterioration pharmaceuticals.
- To study inventory control techniques for different commodities.

8. Research Methodology

The following systematic procedure to be followed will be during in this study

(i) Estimation technique to the demand and deterioration rate.

(ii) Basic assumptions and notations.

(iii) Formation of a Mathematical model.

(iv) Solution of the differential equation under boundary conditions.

(iv) Testing of the optimality conditions.

(v) Properties through sensitivity analysis tables.

9. Proposed work plan

- **First Year**

  In depth reading around topic areas such as: the problems in an inventory control system, review of literature of inventory control techniques.

  Data collection, study of different inventory control techniques for health care system.

  - **Second Year**

    try to develop the order quantity model in case of demand is deterministic.

    Sensitivity Analysis for the EOQ.

    Quantity discount for the EOQ model.

    The comparative study of different inventory control techniques.

    Preparing and drafting of Literature Review.

    •**Third Year**

    Begin planning write up.

    Receive feedback on draft

    Publication of research articles.

    Final write up.

    Final revision begins after proofreading.

    Completion of write up.

    Print-Bind-Submits.

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